



# Alaskan Transportation

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## GASB 34: What is it & How Does it Affect YOU?

Thanks goes to Utah T2 for this article with excerpts from “*Understanding GASB 34's Infrastructure Reporting Requirements*” from Daniel Dornan of Infrastructure Management Group Inc.

With the increased awareness and utilization of Asset Management principles by local agencies, the Governmental Accounting Standards Board (GASB) has moved to formalize the reporting procedures for infrastructure asset reporting. This change should encourage and facilitate the further utilization of this important management and accountability tool.

### Background on GASB 34

In June 1999 GASB unanimously approved Statement No. 34 (GASB 34): *Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments*. Among its many provisions, GASB 34 requires that

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## Stay Sharp: Train Your Team (A Parable)

As long as anyone could remember, the old man had been known as a master woodcutter. One day a young man half his age and twice his size challenged him to see who could cut the most wood in a day. They met on a cool morning in a stand of pine along with a time keeper, a judge, and a group of onlookers. Both men began cutting at the same time, the younger man fairly shoving his axe blade through the trees. He had strength and youthful enthusiasm on his side. The older man worked with patience, technique, and experience.

After a while, the old man stopped for a breather and sat on one of the many felled logs to rest. The younger man saw this as his chance to forge into the lead so he bore down harder, sweat and chips flying.

Even though the older man rested several times during the day and the younger man never stopped, at the end of the day, the older man had cut more wood. The young man was frustrated and angry. He accused the old man of cheating.

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## GASB 34

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state and local governments begin to report on the value of their infrastructure assets, including roads, bridges, water and sewer facilities, and dams.

“GASB 34 provides wide latitude in how infrastructure assets must be reported. However, for state and local governments to comply, it may take significant efforts to define appropriate policies, develop consistent methodologies, deploy asset management systems, and assemble necessary documentation.”

In the Infrastructure Management Group report, the authors summarize the key aspects of GASB 34’s infrastructure reporting requirements, discuss the rationale for these requirements, and identify issues and challenges associated with implementing these requirements in a rational, consistent, and cost-effective manner. Because of their excellent work, and with their permission, we will include much of that material in this article. (All material in quotations is taken directly from that report.)

“To meet their [accountability] obligations . . . governments are required to provide useful, relevant, reliable, and understandable information that addresses the principal needs of a variety of users. . . . Annual financial reports should allow users to assess a government’s accountability to assisting them in determining compliance with finance-related laws, rules and regulations, as well as in making economic, social, and political decisions. The three groups of primary users identified by GASB are: citizens, legislative and oversight bodies, and investors and creditors.”

The driving focus of these accounting and reporting changes, is to “give [government] officials a more

comprehensive way to demonstrate their long-term stewardship of public resources.”

The most “significant and far reaching” of these new requirements deal with the reporting of general infrastructure assets—i.e., “roads, bridges, tunnels, drainage systems, water and sewer systems, dams and lighting systems.” (NOTE: “Buildings are excluded from the definition of infrastructure assets, unless they are an ancillary part of a network of infrastructure.”)

## How Does This Affect Local Governments?

Nationwide, GASB 34 affects about 84,000 local jurisdictions. Infrastructure reporting requirements apply to 28,000 local jurisdictions that own major general infrastructure assets. It allows depreciation or preservation approaches for managing and reporting on those assets.

## What Concerns Have Been Raised About GASB 34?

- Cost-effectiveness of compliance efforts
  - Value of retroactive reporting on infrastructure built since 1980 (not an issue for smaller governments with under \$10 million in annual revenues)
  - Capability of local governments to respond
  - Infringement on local government’s sovereignty
  - Degree of prescription or mandate
- After hearing all these concerns, the Governmental Accounting Standards Board (GASB) concluded that

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*“Improving Alaska’s quality of transportation through technology application, training, and information exchange.”*

infrastructure reporting is essential for the fair presentation of financial results for state and local governments.

## Local Government Implementation

To effectively implement the GASB 34 infrastructure reporting requirement, local government implementation teams will need to be developed. These teams will then need to focus on the following:

- Asset management roles and policies
- Depreciation approaches
- Asset inventory
- Asset valuation
- Performance measures and standards
- Condition assessment
- Asset management planning/programming
- Asset management systems
- Asset renewal/replacement analysis
- Asset disposal policies and procedures

## Considerations for Local Governments

There is not a “one-size-fits-all approach” for responding to GASB 34. Instead, local jurisdictions have the latitude to tailor their response to their particular jurisdiction.

The information gathered in compliance with the GASB 34 requirement is also a base response to the management information needs of infrastructure managers. This information gathering is already underway in many local jurisdictions as they have moved toward using the principles of asset management.

The impetus behind the implementation of this requirement is to more fully support and encourage the principles of asset management and accountability at all levels of public responsibility.

Local governments will want to consider that the gathering and dissemination of infrastructure information provides value to both the government entity and its constituents. It is an opportunity to share infrastructure asset management information with the public and the financial community. The level of detail gathered is driven by the needs of infrastructure managers.

With the ever-increasing demand on local government budgets, the GASB 34 reporting requirements hope to help with effective asset management. This will, in turn, provide local decision-making bodies with the information they need to manage their important infrastructure assets. “What gets measured gets done.”

## Effective Dates

The Infrastructure Management Group report indicates that, “to determine the year when infrastructure reporting must begin, governments will have to determine their total annual revenues for the first fiscal year ending after June 15, 1999.”

## Large-sized Governments

These are defined as having \$100 million or more in total annual revenues.

- Fiscal Year (FY) beginning after June 15, 2001. Must provide “prospective” reporting for all major infrastructure assets built or improved during the fiscal year and report on these assets in subsequent years, using either the depreciation approach or the modified approach.
- FY beginning after June 15, 2005. Must “retroactively” capitalize and report on all major general infrastructure assets acquired, renovated, or improved in fiscal years ending after June 30, 1980, and report on these assets in subsequent years.

## Medium-sized Governments

These are defined as having at least \$10 million, but less than \$100 million, in total annual revenues.

- FY beginning after June 15, 2002. Must provide “prospective” reporting for all major infrastructure assets built or improved during the fiscal year and report on these assets in subsequent years.
- FY beginning after June 15, 2006. Must “retroactively” capitalize and report on all major general infrastructure assets acquired, renovated, or improved in fiscal years ending after June 30, 1980, and report on these assets in subsequent years.

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## Small-sized Governments

These are defined as having less than \$10 million in total annual revenues.

- FY beginning after June 15, 2003. Must provide “prospective” reporting for all major infrastructure assets built or improved during the fiscal year and report on these assets in subsequent years.

## How Should Local Governments Proceed? Organize, Strategize, & Realize

For local governments to organize, they must first obtain executive sponsorship. Then they will need to determine who should be involved. This will include assembling a multidepartmental GASB 34 Response Team. After all this, the team will need to educate executives and staff.

The next step is to strategize. This involves developing a strategic plan (i.e. set goals, objectives, budget, and timeline for response). Key decision points will need to be defined, internal/external resource points will need to be determined, and contingency plans developed.

To fully realize GASB 34 implementation, the GASB 34 Response Team and agency teams will need to be deployed. Progress and test results will need to be tracked. The plan should be refined as needed.

## Short-Term Strategies for Action

To accomplish any task you must know where to begin. Here are a few “short term strategies for action:”

- Assess current capabilities—data, methodologies, and systems
- Determine requirements to be satisfied
- Perform gap analysis between current capabilities and perceived requirements
- Identify new inventories, condition assessment methodologies, and systems
- Develop a strategic plan for achieving compliance
- Determine the level of internal/external financial and technical staff needed to achieve compliance

## Accessing Available Resources

Local governments are not alone in implementing the GASB 34 requirements. There are a variety of resources available to assist you. Here are some of the things you can do:

- Contact GASB staff and review available documents
- Consider what other larger jurisdictions are doing in terms of methods and standards—learn from others
- Contact state agencies leading GASB 34 response efforts for insights into methods and standards
- State auditor’s office, comptroller’s office and/or department of transportation
- Other resource organizations:
  - ◊ accounting firms,
  - ◊ engineering firms,
  - ◊ specialty firms (GIS, asset valuation, asset management)
  - ◊ LTAP Centers

## Opportunities for Coordination

GASB 34 implementation is also an opportunity for expanded intergovernmental cooperation and coordination. This can be at all levels of local government—state, city, and county.

This can mean shared responsibilities and resources for infrastructure inventory, valuation, and condition assessment as well as preventive maintenance activities. It can also mean linked databases on infrastructure characteristics, conditions and utilization, driver information and mobility, and commercial shipper accessibility/mobility.

It can also mean cooperative efforts for emergency response, economic development attractiveness and national defense.

## Summary

Although GASB 34 is a significant and intensive requirement, it also has the potential to provide valuable decision-making and accountability information.





## GASB 34 Implementation Resource Groups (Key State Resource Groups)

- Local government associations
- League of cities/municipal league
- Association of counties
- LTAP/T2 Center Key National Resource Groups
- American Accounting Association
- AASHTO
- American Institute of CPAs
- APWA
- Bond Market Association
- Government Accounting Standards Board
- Government Accounting Advisory Board
- National Assoc. of State Auditors, Comptrollers & Treasurers
- National Federation of Municipal Analysts
- National Governor's Association
- U.S. Conference of Mayors

The Utah T2 Center has devoted a portion of their website to information on GASB 34  
<<http://www.utaht2.usu.edu/>>

## Proposed Rulemaking for Planning, NEPA Implementation, and ITS

The rules are changing and processes are streamlining. To learn more about the rulemakings, read on. Federal Highway Administration and the Federal Transit Administration have three national proposed rulemakings listed on the FHWA website at [www.fhwa.gov](http://www.fhwa.gov). The rulemakings are also published separately in the Federal Register. The rulemaking covers three separate but intertwined areas: Intelligent Transportation System Architecture and Standards, Proposed Rule; Statewide and Metropolitan Transportation Planning, Proposed Rule; and

Transportation Decisionmaking; National Environmental Protection Act Procedures; Public Parks, Wildlife and Waterfowl Refuges, and Historic Sites Protection, Proposed Rule.

Comments for all three are due on August 23, 2000.

North Carolina State University hosted a three-hour live satellite broadcast on June 15, with speakers covering all three rulemakings. The Alaska T2 Center will have copies of the video and the agenda available. Call Simon Howell at 907-451-5482.

# Training

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“Well,” the older man replied, “in a way, you’re right. You see, I know a few things that you don’t know about cutting wood. With your strength and determination, you don’t worry about the accuracy of your axe strokes. If you hit wrong, you hit again and again until you force the tree to fall. I don’t have that much strength or energy, so I have to plan every stroke. I look at the tree to see how it’s leaning, which way the wind is blowing, whether there are any obstructions. Then, I use the absolute minimum number of strokes and let the tree fall of its own accord. I don’t try to force it.”

“But you STOPPED!! I kept working three or four times when you were sitting and watching. How do you account for that?” the young man asked.

“Oh, yeah,” the older man replied, “I forgot to mention that every time I stopped to rest, I sharpened my axe.”

Training is a mental breather for your valued personnel. They may miss a day of effort, but a day of training tells them that you value them as employees, that you have an interest in their future. It tells them that you think that they are worth training. And when they return with new knowledge and a fresh outlook, they will be cutting with a sharper axe.

## Honing Skills of Alaskan Workers

Training is a key element of forming a productive, efficient, and current work force. Training needs to happen for a variety of reasons:

- Skills get rusty if they’re not used regularly
- New employees continually join the team
- People change jobs within an organization
- New techniques, practices and equipment come along that change how we do business.

Alaska Department of Transportation and Public Facilities takes a proactive approach by combining its training programs. We can leverage funding and provide more training to everyone. To that end, the Local Technical Assistance Program (LTAP – also known as Technology Transfer, or T2), National Highway Institute, Native LTAP, National Transit Institute, and some implementation of research training are all handled by staff at Statewide Design



*Grant Wier explains a blading technique from a graphic in the Finish Grader Operator Course Manual*

and Engineering’s Research and Technology Transfer Section. That allowed us to produce over 280,000 manhours of training in the first quarter of 2000. Talk about starting the new millennium with a bang!

We train agency employees to provide road building and maintenance services. This includes DOT&PF personnel, local government work forces—plus consultants and contractors hired by them—and Alaska Natives and other federal and state agencies that either have their own roads or have permitting or approval authority for road building and maintenance activities (since their work has a direct impact on the ability to build and maintain roads).

What have we learned as a result of our training programs? Workers are delighted to have training that meets their needs. And based on verbal feedback, we also know that supervisors are seeing the results. We believe that workers are being more efficient, are applying state-of-the-art knowledge, and are safer at what they do. We know that:

- Grader operators are applying the knowledge they gained.
- People took information home from writing training and immediately used it.
- Traffic engineers are up to speed with the most current MUTCD requirements, and with advanced highway capacity analysis.
- Agency workers and contractors who do hot mix asphalt construction have a better understanding of

how to get a good product, and that communication is the key to early, positive troubleshooting.

- Workers responsible for work zone traffic control on maintenance operations are doing a better job.

Here are sample comments from participant evaluation forms:

From grader operator training: “It gave me a much clearer understanding of how to use the equipment and how to work with the material.”



*Bluetopping exercise: How to windrow excess material in the roadway. Alson Woodward, Warren Davis, and Sam Schuyler watch intently as instructor Grant Wier demonstrates the technique for the Fairbanks Finish Class.*



*Participants in Palmer’s Work Zone Traffic Control for Maintenance Operation on Rural Highways Class set up a model traffic control for a work zone.*

“I feel more confident at accepting an assignment to blade a road.”

From work zone traffic control training: “Very helpful for safer working on streets, especially when diverting traffic from a lane.”

“I feel it was a good workshop because as an introduction to work zone safety . . . a lot of the people who attended haven’t had any real traffic control training and didn’t realize how important it is.”

From Hot Mix Asphalt Construction training: “From an agency standpoint, I found useful information, particularly in respect to how to avoid and correct defects caused during laydown and compaction.”

“It promotes partnering with the contractor and offers many practical solutions to building a quality product.”

From structural welding training: “It increased my welding skills and taught me what a good weld should be like.”



*Being a good structural welder takes practice, practice, practice.*

**Attention! See the Meetings and Events calendar in this issue (page 26) for LTAP training all around Alaska.**

## International Snow Science Workshop 2000

October 1–6, 2000,  
at the Big Sky Resort, Montana.

ISSW 2000 is the 12th in a series of biannual workshops dedicated to providing a forum for the exchange of ideas between snow scientists and snow practitioners charged with the responsibility for snow management and safety.

Additional information can be found on the web site <http://www.coe.montana.edu/ce/issw> or from Ed Adams, Civil Engineering Department, Montana State University, Bozeman, MT 59717.  
Phone: (406) 994-6122 Fax: (406) 994-6105  
e-mail: [eda@ce.montana.edu](mailto:eda@ce.montana.edu)



## 5th International Symposium on Snow Removal and Ice Control Technology

September 5–8, 2000  
Hotel Roanoke & Conference Center,  
Roanoke, Virginia.

Forty-nine presentations by researchers and practitioners from 14 countries will be featured this year, along with some field trips and “road trips.” Visit their web sit at [http://www.vdot.state.va.us/vtrc/main/index\\_main.htm](http://www.vdot.state.va.us/vtrc/main/index_main.htm) to download a very complete preliminary program of the symposium. This program is in .pdf format.



## Third Annual Tribal Road Conference

October 17–19, 2000  
Radisson Hotel and Conference Center  
Albuquerque, New Mexico.

This event coincides with the National Indian Finals Rodeo that occurs Thursday through Sunday that week. Also, the Transportation Research Board is sponsoring a conference on “Transportation Improvements: Experiences Among Tribal, Local, State, and Federal Governments” that runs Thursday through Saturday that same week.

This year’s National Tribal Road Conference will continue a tradition of education and training on:

- Timely transportation topics
- Exciting innovations in transportation programming
- New technology applications
- Competition for equipment operators
- Lunches and the Annual Banquet and Equipment Operators Awards Ceremony

*Reservations: (800) 333-3333 requesting Radisson Hotel on Carlisle and identify the event as the National Tribal Road Conference to get our special room rates.*



## PaveCool 2.0—New Software for Managing Compaction Time



Throughout the United States, contractors and inspectors must contend with less-than-favorable weather conditions for road construction and rehabilitation. If an asphalt mix cools too rapidly, the mix will become stiff, making it difficult to compact to proper density. And a pavement that is not properly compacted will not hold up well to traffic loads.

Successful cold-weather asphalt paving thus hinges on knowing when to start and end pavement compaction. A new customized software program, PaveCool, can help contractors, inspectors, and engineers make quick, informed field decisions about when to start—and when to finish—compacting the pavement. The user enters the time and date of paving, as well as information on the type of mix, the paving location, and environmental conditions. The program then calculates the rate of cooling, which lets the user know how much time is available to properly compact the mix. Armed with that information, the paving crew knows when to start and finish paving. And if that paving window isn't big enough, the crew can take steps, such as increasing the lift thickness or adding additional rollers, to mitigate the effects of the daily environment on pavement compaction.

The software features include a menu of performance-graded binders used in Superpave mixes.

According to Steve Scheuring of Glacier Paving, Cloquet, Minnesota, PaveCool is “great as a reference.

It does the homework for you, while you continue to progress in the paving process.”

PaveCool was developed at the University of Minnesota with assistance from the Minnesota Asphalt Paving Association and the Minnesota Department of Transportation. PaveCool is now available in an updated 2.0 version.

The Federal Highway Administration (FHWA) helped in the review process for PaveCool 2.0 and is helping to distribute the software to state highway agencies and paving contractors. Jim Sorenson of FHWA says, “PaveCool provides engineers with another tool to use when building high quality, durable pavements.”

PaveCool 2.0, which runs on Windows 95/98/NT, is now available for free from the Minnesota DOT Web site ([www.mnrod.dot.stte.mn.us/MNROAD\\_PROJECT/restools/restools.html](http://www.mnrod.dot.stte.mn.us/MNROAD_PROJECT/restools/restools.html)), or can be purchased from the National Technical Information Service's Web site ([www.ntis.gov/fcpc/cpn8573.htm](http://www.ntis.gov/fcpc/cpn8573.htm)).

For more information, contact Jim Sorenson at the Federal Highway Administration (telephone: 202-366-1333; fax: 202-366-9981; e-mail: [james.sorenson@fhwa.dot.gov](mailto:james.sorenson@fhwa.dot.gov)) or your local FHWA division office.



*PaveCool helps states and contractors make quick, informed decisions about when to start and finish pavement compaction.*

## FHWA Introduces Guide on Roundabouts

A comprehensive informational guide for roundabouts is about to be published. The report, *Roundabouts: An Informational Guide* (RIG) covers all aspects of the practice from planning to landscaping. The table of contents is as follows:

- Chapter 1—Introduction
- Chapter 2—Policy Considerations
- Chapter 3—Planning
- Chapter 4—Operation
- Chapter 5—Safety
- Chapter 6—Geometric Design
- Chapter 7—Traffic Design and Landscaping
- Chapter 8—System Considerations

Objectives of the RIG are both educational and prescriptive. The guide provides background information on roundabouts, such as definitions and characteristics of safety and traffic operation issues. The bulk of the safety and operational benefits are based on studies conducted in Europe and Australia. It also includes information about all roadway users—automobile drivers, bicyclists, and pedestrians—with equal attention.

The guide is prescriptive in that it includes all pertinent policies and criteria by the American Association of State Highway and Transportation Officials (AASHTO), in addition to acceptable international practices.

Researchers extensively and critically reviewed European and Australian practices and research publications to combine and create the best recommendations. Although guidelines and practices may vary from one country to another, a certain consensus or trend is common to most countries. When researchers could not develop a convincing recommendation, the decision was left to the discretion of the highway planners and engineers.

Well-designed roundabouts have considerable safety benefits. They reduce the number of potential traffic conflicts and reduce drivers' speed. Based on studies from other countries and the United States, there are 40 to 50 percent fewer injuries or fatal

crashes reported in roundabouts than in conventional stop-controlled or signalized intersections. The safest roundabouts are those with single-lane entries.

Highway planners and designers can learn from these studies and work to reduce crash records at conventional intersections in the United States. Twenty to 25 percent of fatalities and about 35 to 45 percent of crashes involving injury occur at conventional intersections.

About 100 roundabout sites have been built in the United States, and roughly 150 sites are under design or construction. In comparison, the United Kingdom has built approximately 8,000, and France has 17,000 sites. Other countries, including Australia, Germany, the Netherlands, have also constructed numerous roundabouts.

*Roundabouts: An Informational Guide* (FHWA-RD-00-067) will be published on FHWA's website, <http://www.tffirc.gov>. You can order a copy of the report in advance by sending a fax to FHWA Report Center at 301-577-1421, or by e-mail, [marl.green@fhwa.dot.gov](mailto:marl.green@fhwa.dot.gov). FHWA's Report Center voice number is 301-577-0818. FHWA divisions and resource centers will receive copies directly without having to order them.

For more information contact Joe Bared (202) 493-3314 [joe.bared@fhwa.dot.gov](mailto:joe.bared@fhwa.dot.gov)



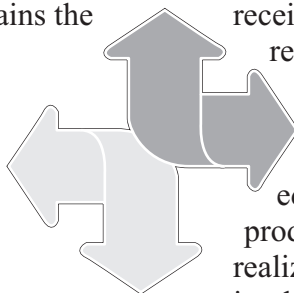
*Roundabouts: An Informational Guide provides background information and discusses the safety and operational benefits of roundabouts.*



## MUTCD Millennium Edition

The Federal Highway Administration, Office of Transportation Operations is in the process of a major rewrite of the *Manual on Uniform Traffic Control Devices* (MUTCD). The MUTCD contains the criteria used by traffic engineers and transportation officials to communicate safe driving messages to the roadway users. This manual contains the standards and guidance for the design and use of signs, pavement markings, traffic signals, and other traffic control devices. The last time that the MUTCD was rewritten in its entirety is over 20 years ago. Innovative technology, roadway developments, new traffic control device applications, and complicated technical text has made it necessary to reexamine the information in the current 1988 edition of the MUTCD. A major rewrite and reformat effort of this manual has been underway since 1995 to incorporate technology advances in traffic control device application and to improve the overall organization and discussion of the contents in the MUTCD to make it clearer and more user friendly. The MUTCD is incorporated by reference in 23 CFR part 655, and all changes to the MUTCD must be made through the Federal Register rulemaking process. This process allows all interested persons to provide comments on the proposed changes. The FHWA has published Federal Register notices of proposed amendments for all of the following Parts of the MUTCD:

- Part 1—General Provisions
- Part 2—Signs
- Part 3—Markings
- Part 4—Signals
- Part 5—Traffic Control Devices for Low Volume Rural Roads (New)
- Part 6—Traffic Control for Construction and Maintenance
- Part 7—Traffic Control in School Areas
- Part 8—Traffic Control at Highway-Rail Grade Crossings
- Part 9—Traffic Control for Bicycle Facilities
- Part 10—Traffic Control for Light-Rail Transit (New)



FHWA has also published a notice of proposed update information for Parts 1, 3, 4, and 8. Public comments for all parts of the MUTCD must be received by June 2000, at which time FHWA will review and summarize the comments and prepare a Final Rule position that will be published in the Federal Register in December 2000. The FHWA realizes the critical role public awareness and education play when introducing new or revised products to our customers and partners. They also realized that the new policies and technologies that we implement will have a strong impact on our citizens and industries well into the 21st century. The FHWA goal is to expand our traditional network and audience to include others such as motor vehicle departments, driver's education classes, law enforcement personnel, travel and tourist agencies, community civic leaders, and emergency response providers.

In an effort to create more public awareness of the MUTCD, the FHWA is publishing the Millennium MUTCD in several media formats: traditional hard copy, CD-ROM, and Internet. The Federal Register notices and the proposed text are available at the following Internet locations: The Federal Register home page is <http://www.nara.gov/fedreg> and the MUTCD home page is <http://mutcd.fhwa.dot.gov>. The FHWA is expanding our web site to include electronic briefing presentations that provide an overview of the proposed MUTCD changes and a database management program which can be used to research historical and background information on various MUTCD requests for changes, experimentation, and interpretations. Other features will be added in the future as we endeavor to make the MUTCD web site a "one stop shop" for information concerning traffic control devices. We hope that you will share our MUTCD web site with others who may have an interest in optimizing performance and highway safety through the use of traffic control devices.

For more information contact Lisa Haakon Pogue, Director of Technology Transfer LTAP Clearinghouse, American Public Works Association, 1301 Pennsylvania Ave. NW, Suite 501, Washington, DC 20004  
phone 202-347-7267, fax: 202-737-9153,  
Web: [www.ltapt2.org](http://www.ltapt2.org)



# Bringing the Nighttime Road to Life

by Patrick Hasson, Safety Engineer, FHWA Midwestern Resource Center,  
Ernie Huckaby and Rudy Umbs

**Some Background:** The risk of dying in a crash at night is nearly three times the risk of dying in daylight hours. In 1998, about 27,000 people died in nighttime traffic crashes in the United States, even though only about 25 percent of travel is at night.

One of the reasons that nighttime driving risk is so much higher is because in the daylight the road is filled with more visual cues that help to guide drivers and keep them on the road. Although a single causal factor cannot be assigned to nighttime crashes, it is clear that an individual driver's night vision characteristics and a lack of adequate visual guidance information are significant factors. In either case, if cues that are essential for safe driving are inadequate at night, the potential for a driving or judgmental error to result in a serious crash are considerably increased. The situation is only made worse when other factors—i.e. fatigue, intoxication, inclement weather, higher speeds of travel on some roadways, etc.—combine with inadequate traffic control devices to make nighttime driving less safe. The issue of visibility on rural roads—i.e. the greatest distance under given weather conditions to which it is possible to see—is of special interest when one considers that nearly 60 percent of all road fatalities in the United States occur on rural roads. The risk of dying in a rural road crash is more than twice as high as the risk of dying in a crash on an urban road or a nonrural Interstate. There are many reasons that the risk of dying on a rural road is higher, including differences in operating speeds, road geometry, functionality, and other factors. It is these factors that create the situation in which nearly 80 percent of all fatal rural road crashes are either run-off-the-road, intersection, or head-on collisions. The possibility for any of these crash types is heightened at night and, for each, visibility is a key factor. The case for retroreflectivity visibility can be improved through a variety of means such as retroreflectivity, roadway



lighting, and automobile headlights. Although retroreflectivity in the form of pavement markings and sign sheeting does not resolve all of the problems, especially in wet or other adverse weather conditions, its relative low cost and versatility makes it a preferred alternative for most applications today. At night, with many of the visual cues missing, the driver relies on the added retroreflective elements of signs and markings such as edge lines and post-mounted delineators for curve preview and center lines for guidance in the curve. It is very possible that these will be the major visible elements to a driver on a road at night. The retroreflectivity of signs and markings can serve to provide positive visual guidance that helps drivers keep their cars in their lanes or on the road. They also offer the possibility to share critical and timely warning, location, and other information to drivers. The retroreflectivity of signs and markings is a critical ingredient in creating a much safer road environment. As an example of the safety value added by retroreflectivity, consider a sharp curve on a rural road. In the daytime, there are many visual cues such as a line of trees or a guardrail that can alert the driver to the sharpness of the turn in time for a driver to alter his speed accordingly. Road engineers also use pavement markings to reinforce these cues. A retroreflective edge line in this situation will provide the driver with a long-distance preview of the curve while the center line will provide other



useful guidance through the turn. Retroreflective materials are subject to deterioration brought on by the natural elements, and the ability for a sign, delineator, or pavement marking to continue to provide quality information or guidance to a driver decreases over time. If some minimum retroreflectivity is not maintained, the sign, delineator or marking will not accomplish the job it was intended to perform. While the *Manual on Uniform Traffic Control Devices* (MUTCD) has required since 1954 that signs and pavement markings shall be reflectorized or illuminated, the MUTCD contains no minimum in-service retroreflective requirements for signs or markings. (Note: ASTM D4956-89 Standard Specifications for retroreflective sheeting purchase specification used by the states is not to be confused with in-service minimum levels of retroreflectivity.) This fact coupled with the recognized importance of retroreflectivity to highway safety motivated the U.S. Congress to pass a law in 1993 that required the Federal Highway Administration (FHWA) to establish minimum maintained levels of retroreflectivity for signs and pavement markings.

## What Does This Mean to You?

The minimum maintained levels of retroreflectivity that are accepted will have many potential impacts. First, it is likely that the guidelines will have the greatest impact on the maintenance of signs on the National Highway System (NHS). Beyond the NHS the impacts are less clear. Certainly, some States may require that all local road agencies adopt the minimum guidelines. However, other States may not go that far. But the mere existence of minimum guidelines could create a situation in which local agencies are compelled for one reason or another—i.e. liability issues, etc.—to begin applying the minimum guidelines in their regular practice. As well, from strictly a safety point of view, minimum guidelines will provide a valuable tool for road engineers to use on roads that have high traffic volumes or for high hazard locations. For all of these reasons, it is essential that road managers and engineers stay abreast of the development of the guidelines and consider how they will have an impact in their future road programs.

In another vein, the costs associated with implementing minimum maintained levels of retroreflectivity for signs have been examined. Based on the average condition of road signs in 1994, the FHWA estimated in 1998 that 5 percent of signs under state jurisdictions and about 8 percent of those under local jurisdictions would not meet the proposed minimum maintained levels of retroreflectivity and would therefore need to be replaced. This translated to a cost of about \$32 million for the state agencies combined and about \$144 million for the local agencies combined. These are costs associated with replacing all signs at one time. The report concluded, however, that on a practical level, sign replacement rates would probably not be accelerated above current levels and many agencies would not likely feel any impact of implementing the minimum maintained levels of retroreflectivity. The report went further to state that the development of a sign inventory program that includes retroreflectivity measurements would lead to making investments in a planned manner that, in the long run, are likely to reduce the overall maintenance and replacement rates of traffic signs in the future.

## What's Being Done?

The FHWA has been performing retroreflectivity research to improve nighttime driving safety since the early 1980s. Some of the areas covered in this research included studies on the service life of signs, sign and pavement marking management systems, and traffic sign and pavement marking retroreflectometers. Following the Congressional requirement in 1993, the FHWA also completed research on what levels of retroreflectivity are needed to safely guide drivers at night and analyzed the economic impacts to the public if minimum retroreflectivity values are established. The overall goal of all of these studies was to obtain information necessary to establish minimum maintained levels of retroreflectivity and to develop management programs and measurement devices that will be needed by the states and others to maintain traffic control devices at an adequate level. Thirty-two states were actively involved with the FHWA in this research.

*continued*

Recognizing that there are already many different models of hand-held retroreflectivity measuring devices available today, the FHWA began to develop mobile units capable of measuring the retroreflectivity of signs and markings while driving at highway speeds. A van capable of measuring the retroreflective qualities of pavement markings was introduced and demonstrated a few years ago. Private industry is now manufacturing and selling these units as well as providing contractual support for their operation and maintenance. Similar vans for measuring the retroreflective qualities of signs are now in development by the FHWA and will be available for demonstration purposes in 2000.

An AASHTO task force is actively reviewing completed research on this subject and intends to make a recommendation to FHWA on minimum maintained levels of retroreflectivity. The FHWA will consider this recommendation and other information before it issues a notice of proposed rulemaking (NPRM). After analyzing the comments to the NPRM, a Final Rule could be issued in 2001 for signs and 2002 for pavement markings. The rules will address plans to implement minimum maintained levels of retroreflectivity for each. The Federal Register notice invites the widest possible review and comment by the public.

## Other Steps to Improve Visibility

Recognizing that retroreflective devices have their limitations in some circumstances, the FHWA is also examining a host of other possibilities for making roads safer at night. For instance, there has been preliminary research on the use of ultraviolet headlights in automobiles. These headlights will allow drivers to use their low beam level yet see fluorescent traffic control devices as if they had their high beams on. This allows drivers to see better at night but does not create the glare problems associated with standard headlights. The FHWA, in cooperation with Volvo and others, will be performing an extensive demonstration project with UV headlights and fluorescent signs and pavement markers next year. Another area of interest is phosphorescent materials that could be incorporated into traffic control devices so that they will glow at night. This is an area that is developing rapidly and leading to new materials that glow for longer and longer periods. It is likely that in the next five years or

less there will be materials that can glow all night or for days at a time. These products may help to overcome some of the limitations of retroreflective materials. Finally, there have been tremendous advances in the development of LED lights for augmenting pavement markings, and several products are available today. Generally, the LED lights are small solar-powered markers that are installed in the pavement. Though most of the current applications of these lights have been outside of the United States, it is recognized that there may be value in using these devices in some hazardous locations. Currently, there is a proposal to install LED lights in a heavy fog area in California.

## Conclusion

Retroreflectivity is a critical element for helping the U.S. Department of Transportation achieve its safety goal of reducing fatalities and injuries by 20 percent over 10 years. Although the FHWA has provided the primary guidance for many national efforts related to retroreflectivity, state and local highway officials have provided essential input throughout the process. Organizations such as the National Association of County Engineers, National Cooperative Highway Research Program, National Committee on Uniform Traffic Control Devices, American Association of State Highway and Transportation Officials, Institute of Transportation Engineers, state DOTs, the American Traffic Safety Services Association, the American Public Works Association, and others have also been involved to ensure that the results of the extensive research activities and field evaluations are implemented reasonably and prudently through the rulemaking process. The FHWA expects that this cooperation will lead to minimum levels of retroreflectivity that will be maintainable, increase nighttime safety on the roads, and ultimately result in fewer crashes, injuries and fatalities on our roads at night. In addition, the planned, systematic replacement and maintenance of signs and markings could reduce their overall maintenance and replacement rates in the future. While these types of benefits are appealing, it must be reiterated that the ultimate goal in pursuing these efforts is to elevate the existing safety of U.S. roads for the benefit of the entire driving population.



# Walter Lum's Rules of Thumb

## Estimating Water Flow at a Construction Site

From Hawaiian Connections, the Hawaii LTAP newsletter by Walter Lum, consulting engineer, Honolulu, Hawaii. Walter Lum, through many years of experience has developed quick and easy ways to solve complex problems. He has agreed to share his rules of thumb with us.

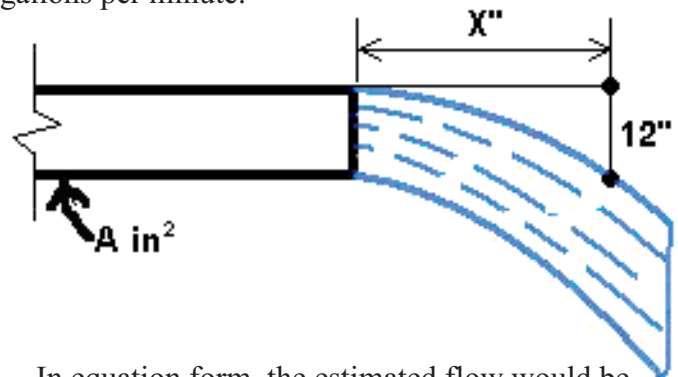


Have you ever wondered just how much water was being pumped to dry up the excavation? Contractors usually count the number of pumps and sum up the rated capacity of each pump to estimate the water flow. This method greatly overestimates the actual quantity of water being pumped. Better methods would be to use 55-gallon drums, weir boxes, or other flow measuring devices.

Two methods that give reasonably close approximations of flow quantities will be presented: The trajectory method and the eyeball method.

### Trajectory Method

This method consists of finding the cross-sectional area of the flow from a horizontal conduit and measuring the distance out for a jet of water to fall 12 inches. The area of the flow in square inches times the distance out in inches will approximate the flow in gallons per minute.



In equation form, the estimated flow would be

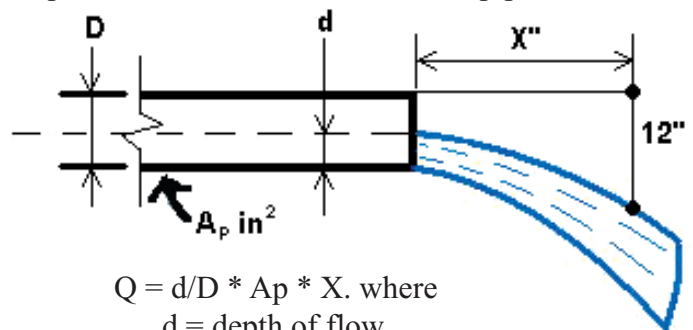
$$Q = A * X, \text{ where}$$

$Q$  = flow, gallons per min.

$A$  = cross-section of flow, sq. in.

$X$  = Distance out for jet to fall 12 in., in.

For partial pipe flows, the cross-sectional area of the flow may be estimated as being proportional to the depth of flow to the diameter of the pipe.



$$Q = d/D * A_p * X, \text{ where}$$

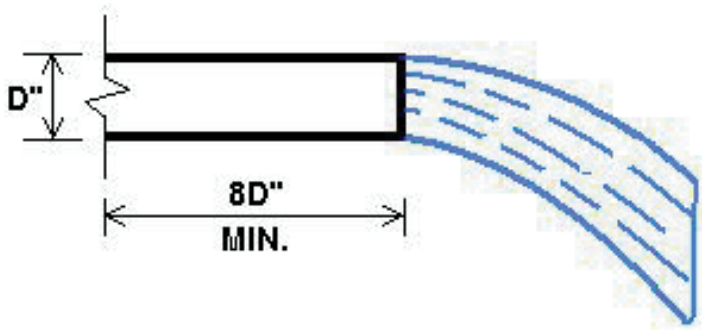
$d$  = depth of flow

$D$  = diameter of pipe, in.

$A_p$  = area of pipe, sq. in.

## Eyeball Method (for 4-to-12 in. pipes)

This method consists of first computing or knowing the quantity of water flowing just barely full through a horizontal pipe, then eyeballing the flow for partially full pipes.



The quantity of water flowing through a horizontal pipe (8 diameters long, minimum) flowing barely full may be computed by formula as:

$$Q = 8.5 * D^{2.5}$$

where,

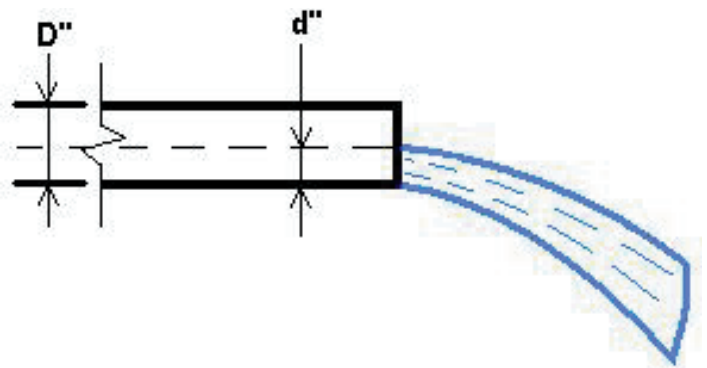
Q = full pipe flow, gallons per minute

D = diameter of the pipe, in.

For 4-to-12 inch pipes, the following quantities may be used for various pipe sizes when the pipes are flowing barely full, in gallons per minute.

4 in.	6 in.	8 in.	10 in.	12 in.
270 gpm	750	1,540	2,690	4,240

For partial pipe flows, the quantity may be estimated as being proportional to the depth of flow to the diameter of the pipe to the 1.7 power or,



$$Q_{\text{partial}} = (d/D)^{1.7} * Q_{\text{full}}$$

where,

Q = flow, gallons per min.

d = depth of flow, in.

Then, for partial pipe flows, the flow can be estimated by eyeball as follows:

For 3/4 full pipe,

$$Q_{3/4} = .6 * Q_{\text{full}}$$

$$Q_{1/2} = .3 * Q_{\text{full}}$$

$$Q_{1/4} = .1 * Q_{\text{full}}$$

Reference: Powers, P., *Construction Dewatering*, Wiley, New York, 1992.





# The Dangers of

# ROAD RAGE

Text and photo courtesy  
State Farm Insurance

Do you make a habit of tailgating, lane-hopping or racing to beat a traffic light? Have you ever aggressively pushed your way through small openings in traffic? Do you find yourself constantly criticizing and condemning other drivers? If you've been in any of these situations, you could suffer from road rage. The reasons for road rage include more traffic congestion, more stress, chronic rushing and more disrespect. Combined, these factors create an explosive mix. How can you avoid the pitfalls of road rage? When you are frustrated in heavy traffic, you can take these positive steps:

- Try to avoid unnecessary contact with other drivers.
- Rather than seeing yourself as an antagonist on the road, see yourself as a helper—someone who supports other drivers.
- Avoid criticizing or ridiculing other drivers.
- If you are being taunted, do not retaliate.

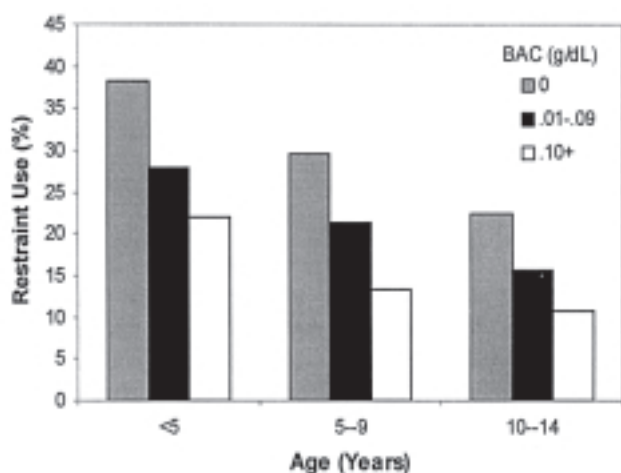
By not reacting, you're exercising power over the other driver. Taking steps to control and eliminate stress on the road can help everyone stay safe behind the wheel.



# Research Update: Child Passengers Killed in Alcohol-Related Crashes Usually Riding with a Drinking Driver

Quinlan, K.P, Brewer, R.D, Sleet, D.A, Dellinger, A.M.  
*Characteristics of child passenger deaths and injuries involving drinking drivers.* Journal of the American Medical Association 2000; (283) 17:2249-52.

A Center for Disease Control (CDC) study published in the May 3, 2000, issue of the *Journal of the American Medical Association* indicates that of the 5,555 child passengers younger than 15 years old killed in drinking driver-related crashes during 1985—1996, 64% (3,556) were riding in the vehicle with the drinking-driver. The drinking driver was typically old enough to be the age of the child's parent or caregiver. Analyzing national crash data from the Fatality Analysis Reporting System maintained by the National Highway Traffic Safety Administration, CDC researchers found that fatality rates for child passengers killed while being transported by a drinking driver declined from 1985 through 1990 but remained virtually unchanged from 1991 through 1996. The study also found that as the blood alcohol concentration of the child's driver increased, child restraint use decreased (see figure).



*Restraint use among child passenger fatalities by child's age and the blood alcohol concentration (g/dL) of the child's driver—United States, 1985—1996 (n=18,018)*

## Implications for Prevention

The authors recommend that strategies to specifically deter individuals from drinking and driving with children in the vehicle should be added to existing policies that deter alcohol-impaired driving in general (e.g., administrative license revocation, mandatory substance abuse assessment and treatment for DUI offenders). Suggested strategies include the following:

- States should consider lower legal blood alcohol limits for drivers transporting children.
- The effectiveness of current child endangerment laws (special sanctions for drivers convicted of DUI with a child in the vehicle) should be evaluated.
- Families can adopt their own zero alcohol tolerance policy when transporting children.
- Health care providers can screen adult patients for alcohol problems and provide them with or refer them to appropriate treatment.
- Health care providers can include information on the dangers to child passengers when they counsel their patients about the risks of alcohol-impaired driving.
- States should strictly enforce existing child safety seat laws and pass primary seat belt laws that cover all children in all seating positions in the vehicle.

For more information about this study, contact Kyran Quinlan, M.D., M.P.H., David Sleet, Ph.D., or Ann Dellinger, Ph.D., at the Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Unintentional Injury Prevention, 770/488-4652, [kaqo@cdc.gov](mailto:kaqo@cdc.gov). To learn more about this and other activities at NCIPC, visit our web site at [www.cdc.gov/ncipc/](http://www.cdc.gov/ncipc/)



## Web Site of the Quarter

“Get There on the Information Superhighway” is how **highwayinterchange.com** is announcing their on-line Web community dedicated to supporting the highway industry. We quote here from their brochure: “From Engineers to Educators, Consultants to Contractors, both public and private sectors, everyone has a special place in our community. This innovation is simply a smarter way to go. **highwayinterchange.com** is a virtual trade show open 24/7/365.

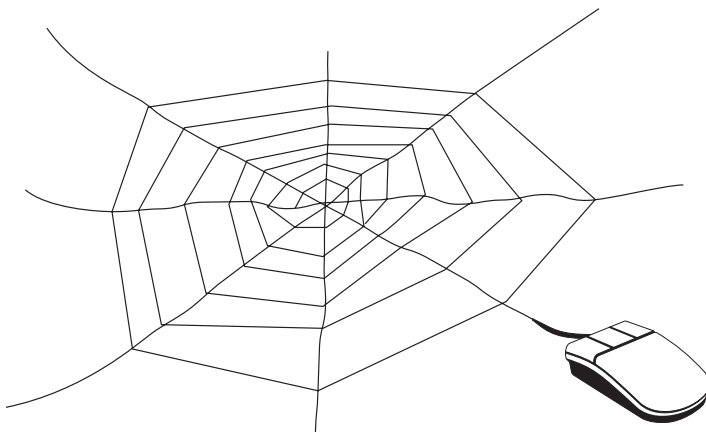
- This enables you to:
- Save time with all industry references in one location.
  - Save money with a free dedicated personal office, complete with e-mail.
  - Stay tuned to RFP opportunities.
  - Stay smart about products and services.
  - Develop relationships and partnerships.
  - Keep track of industry news and events.
  - Be proactive in your own professional development.

**Highwayinterchange.com** connects you with the people, information, and resources to get you where you want to go.”



## Spinning Your Own Web Site

First in a series of articles about web site development reprinted here with permission from *Technology News* of the Iowa State University and the Center for Transportation Research and Education



A well planned World Wide Web (web) site takes time to develop, but it's worth the extra effort when your customers can easily find the information they need. Even if you plan to outsource your web site's design and maintenance, answering the questions below will help your future webmaster (and you) understand your vision for the site.

### 1. What's your purpose for publishing a web site?

Remember that the web is an interactive medium. Not only can you provide information to your constituents, but they can interact with your department or agency. Think of a web site as an extra customer service counter, one that can be accessed 24 hours a day.

### 2. Who are the intended audiences?

Knowing who you're planning this web site for will help you decide what kind of information to include on your site, how to organize it, and how to present it. Potential audiences include:

- people who live in your city or county
- visitors to your area other city or county agencies/ departments

*continued*



- your city council or county supervisors
- utility companies
- local businesses

### 3. What are the short- and long-term goals of your web site?

Is the web the best way to meet those goals? Possible short-term goals include:

- publishing information and e-mail link to contact staff
  - publishing this year's construction plans
  - describing your department's/agency's primary mission
  - advertising job openings
  - announcing bid openings
  - announcing snow emergencies and road closures
  - providing an e-mail link for customers to request maintenance
  - publishing news releases
- Possible long-term goals include
- providing an online service request form for customers to report maintenance problems on their streets or roads
  - publishing an online newsletter for your constituents
  - providing an online library of all agency policies
  - publishing maps of future construction plans

### 4. What can you afford?

There are several factors to consider here that basically break down into four categories: short-term and long-term costs, personnel, and equipment. In addition to the initial development costs, remember that a web site needs regular maintenance. If you put all your money into setting up a web site and then never update the information or make sure all the links still work, you've wasted your time and money because your site will lose credibility with the very people you're trying to reach. Specific personnel costs can vary dramatically:

- Will you hire someone to be a webmaster to create and maintain your site?
- Will you contract with someone to develop the site but have existing staff maintain it?
- Will your staff do all the development and maintenance?

- Will you hire an outside firm to develop, maintain, and host your site?
- Who will oversee or manage the site?

A web site needs a computer, called a server, to run on. Your department doesn't need its own server in order to have a web site. If your city or county already has a network and server in place, it's possible the city or county would host your site. Another option is to have an Internet service provider host your site for a monthly fee, usually about \$50 for small sites. The City of Ames saves \$3,000–4,000 per year by maintaining its own site. Clare Bills, the city's public relations officer, is the overall webmaster, but each department maintains its own pages. Bills says "we looked for natural talents" when it was decided If you think it's time for your transportation agency, either by itself or as part of a city or county government, to publish a web site, this series of articles will help you think through the planning stages of developing a web site and then provide several how-to articles to guide you through the nuts and bolts of web site creation. More detailed versions of these articles will appear online at [www.ctre.iastate.edu/outreach/web/](http://www.ctre.iastate.edu/outreach/web/) with links to even more resources. The series will also be reprinted in a handy booklet and distributed to local transportation agencies where existing city employees would maintain the site. "Each department has a sense of ownership," Bills says. Interested people volunteered and were trained on Microsoft's FrontPage software. No additional salary is paid to anyone. The city's site is hosted by Lighthouse Communications, an Internet service provider in Des Moines. Bills sends the changes people have made to the web site to Lighthouse Communications at the end of each day.

The next article in this series will address hardware and software needs for developing and maintaining a web site and how to get connected to the Internet.

*For more information about the City of Ames' site ([www.city.ames.ia.us/](http://www.city.ames.ia.us/)), call Clare Bills, 515-239-5101.*

*For more information about developing a web site for your transportation agency, call Michele Regenold, communications specialist and webmaster at CTRE, 515-296-0835, [michele@ctre.iastate.edu](mailto:michele@ctre.iastate.edu).*





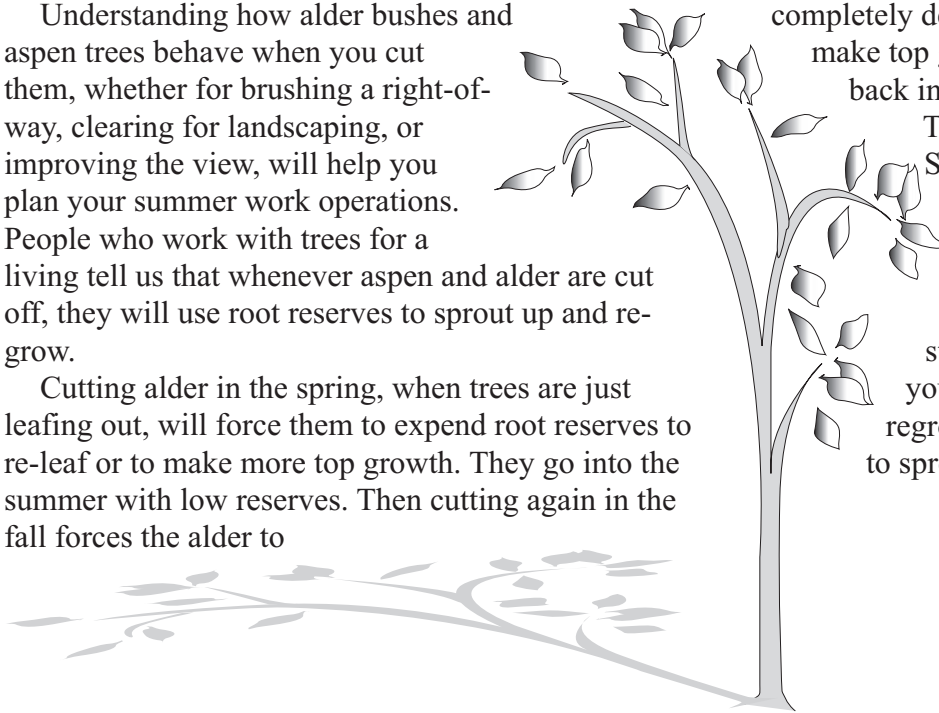
## Managing Pesky Alders and Aspen

Understanding how alder bushes and aspen trees behave when you cut them, whether for brushing a right-of-way, clearing for landscaping, or improving the view, will help you plan your summer work operations. People who work with trees for a living tell us that whenever aspen and alder are cut off, they will use root reserves to sprout up and re-grow.

Cutting alder in the spring, when trees are just leafing out, will force them to expend root reserves to re-leaf or to make more top growth. They go into the summer with low reserves. Then cutting again in the fall forces the alder to

completely deplete its root reserves as it attempts to make top growth again. With luck, it won't come back in the spring.

There's an additional trick with aspen. Since aspen are all interconnected underground, cutting down a whole stand won't accomplish much. They will sucker along like mad and grow back up. If you leave a few mature stems or trees at the boundary of what you're brushing, you'll have less regrowth, and they won't sucker as badly to sprout new growth.



## National Historic Preservation Act Training

*Article provided with input from Kris Benson, DOT&PF, Southeast Region*

Two instructors from the national Advisory Council on Historic Preservation (ACHP) presented a two-day training session in Anchorage during May 2000. They focused on Section 106 of the National Historic Preservation Act (NHPA), particularly on the new regulations for implementing NHPA that ACHP revised in 1999. The course, attended by participants from tribes and state and federal agencies, introduced the 1999 amended review process required under Section 106 of NHPA. Instructors used case studies, workshop dialogue, and step-by-step descriptions of required activities to assure that participants understood the changes.

Because every federally funded project must comply with NHPA, it is critical that the agency workers fully understand the review process when they use it during their project development activities. Funds can be withheld from projects or projects can be halted if the Section 106 process isn't followed in the appropriate manner.

The two instructors began by noting that Section 106 of the NHPA has only two requirements. These

are: federal agencies must (1) take into account the effects of their undertakings on historic properties, and (2) give the ACHP an opportunity to comment regarding their undertakings. Although these requirements seem simple, the instructors detailed how to meeting them, making it clear to course participants that the process can become a long and complex.

The process occurs in basically four steps:

- Step 1—initiate the process;
- Step 2—identify historic properties;
- Step 3—assess adverse effects (if historic properties are identified);
- Step 4—resolve adverse effects (if such effects are identified).

The complex process became more meaningful through the step-by-step presentation of the details, the case studies, and the discussion among participants.

Alaska's state historic preservation officer attended the course and added comments applicable to some of the unique situations that occur in Alaska.

# Alaska DOT&PF Highlights New Statewide Research Activities

Each year, Alaska DOT&PF's Research Section solicits research needs statements from within the department and from transportation workers statewide. Housed in Statewide Design and Engineering Services, Research is charged with improving how the department and others build and maintain Alaska's transportation infrastructure. Past projects resulted in implementing new procedures, different techniques, materials that work better, and equipment that better meets the needs of its user. Research activities apply to all phases of project development and maintenance: planning, design, construction, operation, and maintenance. Safety and minimal impact on the environment are always a concern for the department in all activities, as is using state and federal resources efficiently and cost-effectively. Researchers have the same focus while developing and implementing research projects.

While researchers specifically collect needs statements each year in August, anyone can submit a transportation research need at any time. That submittal will be held for the fall research advisory board meeting, where needs are ranked and projects selected.

New project starts this year reflect a broad range of activities. Some of the new projects are likely to be multi-year activities, while others will be finished in one or two years. Some are done solely in Alaska, while others are handled jointly with other states.

## Alaskan Soil Stabilization Manual

This manual would be an ideal designer's tool for evaluating options and costs of soil stabilization, particularly in areas of Alaska where only poor quality aggregates are readily available. Barging in the base course and surfacing materials can elevate costs to more than \$100 per cubic yard. There are instances where locally available materials, properly stabilized, might be obtained at 75% or less of the imported cost. In less extreme cases, a mildly degradable base course might benefit from adding a small dose of stabilizer to

achieve a much longer pavement design life—at a nominal cost.

A review of the existing voluminous body of literature will be distilled into a compendium of methods most applicable for treating Alaskan materials, then compiled into a definitive soil stabilization reference. The reference will provide quick access to stabilization types, mix design methods to determine the correct amount of stabilizer, and techniques useful for common Alaskan materials. Researchers envision the manual to include summaries, tables, and graphical devices such as decision trees.

## Snowplow Survivability of Guardrail Systems

Throughout Alaska's road system, there are damaged longitudinal and end sections of guardrail. FHWA has asked Alaska DOT&PF to fix these problems. The department must choose guardrail components that are both FHWA-acceptable and robust enough to withstand normal maintenance wintertime operations. Properly selected components will save millions of dollars over the years. Many new terminals will be installed each year, so the results of this study are critical and needed soon.

Researchers will evaluate new guardrail end section components which are currently installed, or which will be installed as part of this project, along roads in heavy-snow areas of Alaska. It is important to determine how well various components withstand loads generated during actual snow plowing and blowing operations. High pressures generated when snow is pushed against rail sections and terminals (not direct plow-guardrail contact) destroy guardrail components.

For example, one of the newer FHWA-approved end sections appears not to hold up well during snow plowing. The SRT-350 was designated in 1995 as one of only two acceptable 2-beam terminals (more have

been added since then), and many were installed in Alaska. The SRT-350s have not held up well; many reportedly were damaged as snowplows pushed snow against them. All SRT-350s recently installed in Turnagain Pass were damaged after a single winter.

Besides finding the sturdiest and most robust product, this project will determine if guardrail end sections can be made more visible to plow operators.

## Design Discharge for Fish Passage Culverts

Alaska Department of Fish and Game uses criteria specifically for Arctic grayling to determine stream discharges that are then used to design culverts for fish passage. While this application is certainly appropriate where Arctic grayling exist, blind application of designs developed for grayling results in potentially inappropriate designs for other species. We know that juvenile salmon use the boundary layer along the culvert walls to pass through the culvert.

Unfortunately, a lack of understanding exists about the velocities of the flow near the culvert walls. Culvert inlets represent a major barrier to fish passage. Researchers will investigate methods to remove this barrier. Researchers and the project proposer

anticipate developing reasonable criteria to determine design discharges for other areas of the state, and surmise that design discharge will more closely match geography and species. The end result should yield culvert installations that are neither over- nor under-designed. We anticipate doing this project jointly with other states experiencing similar situations with regard to fish passage and water velocities.

## Eliminating Longitudinal Cracking Using Rock Side-Slopes

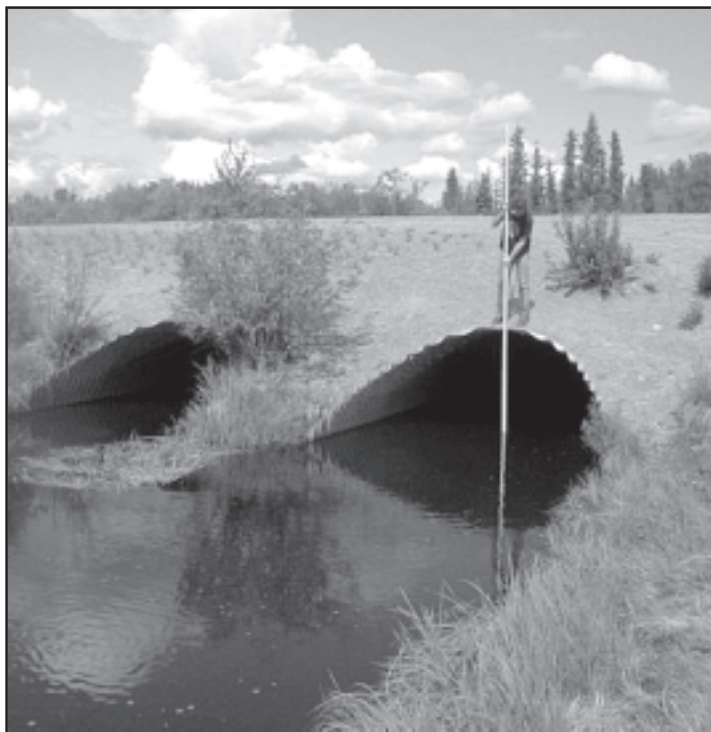
Many interior Alaska roads are constructed in regions of warm permafrost and experience a significant rate of failure due to longitudinal cracking. Longitudinal cracking occurs because the permafrost thaws at an accelerated rate at the south-slopes of the embankment. The thawing results from high mean temperatures on the side-slope from two sources: (1) thick snow layers in winter, because of snow clearing operations, and (2) relatively high summer temperatures. Foundations soils subsidence beneath the side-slopes causes shoulder rotation and longitudinal cracking. Deep cracks in the pavement surface result in hazardous driving conditions and frequent maintenance.

This research examines a new technique to cool embankment side slopes, with the goal of avoiding accelerated thaw and longitudinal cracking. The technique involves the use of a layer of poorly graded aggregate with low fines content and very high permeability. High permeability will allow circulation of ambient air through the shoulder of the embankment during winter, thus providing an enhanced cooling effect. If the techniques proves viable, it could offer a cost-effective method to avoid longitudinal cracking and eliminate safety and maintenance issues.

## Gravel to Pavement Roads Impact

Currently, there is no documentation on the effects of paving gravel roads, so the department is unable to respond to questions on the direct and indirect effects of paving gravel roads. What are the effects on traffic,

*continued*



*Edgerton Willow Creek Outlet*



tourism, and land use? The inability to address these questions has affected several projects. As the department increasingly seeks to pave gravel roads to reduce maintenance costs and improve driveability, the public, special interest groups, and other agencies will continue to ask questions. What are the direct and indirect socioeconomic effects of the paving projects? This research activity will document the qualitative or quantitative effects that paving gravel roads has on traffic, tourism, land use changes, and maintenance costs. The result will provide project staff the ability to answer questions about secondary impacts and environmental considerations of paving gravel roads, and could benefit the department by reducing or eliminating project delays caused by the previous lack of information.



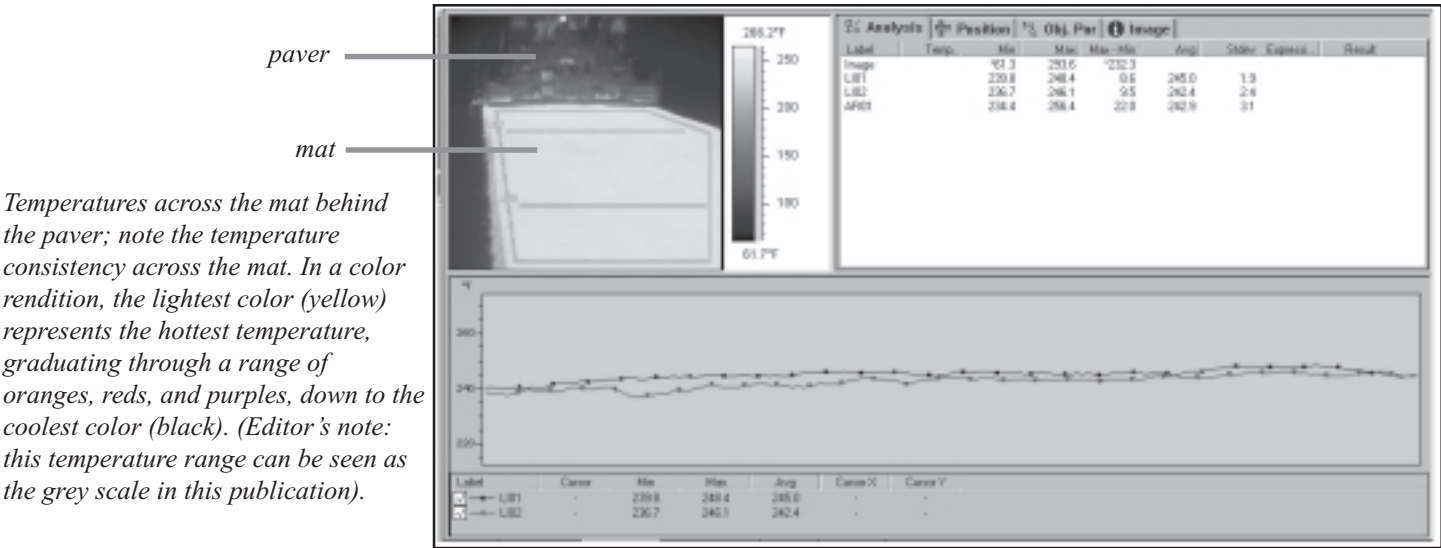
*Paving on the Steese Highway. To find out what the asphalt temperatures are just out of the paver, the workers took digital snapshots of the mat behind the paver.*

## Reducing Thermal Segregation

The effects of thermal segregation reduce pavement life in various ways. One of the better-known ways is through inconsistent compaction. Uncompacted pavement results in rutting, ravelling, and fatigue cracking. Other ways include hot mix temperatures that are either too hot or too cold, placing loads from the hot plant improperly in the haul truck box, allowing the windrow of dumped hot mix to get too long in front of the paver, allowing the hot mx to stay in the dump box too long.

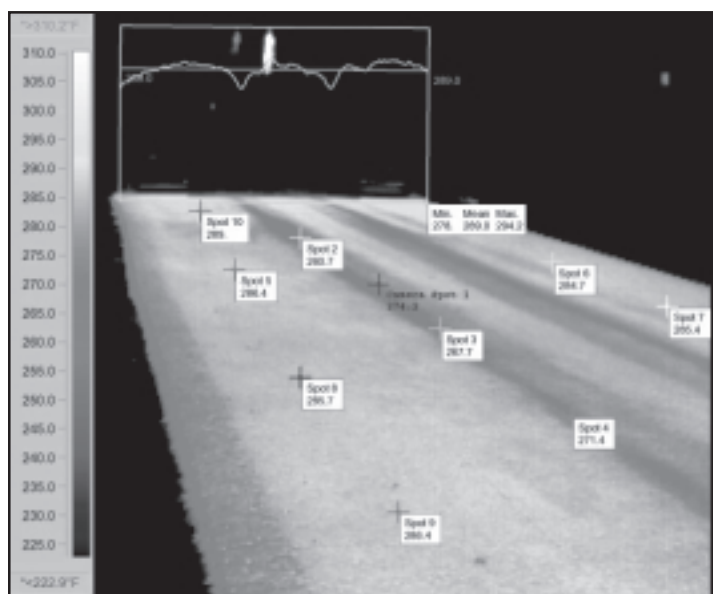
Until recently, measuring thermal segregation has been difficult because the measuring and identification technology didn't exist. Also, from outward appearances, thermal segregation mimics conventional segregation, so everyone involved in the paving process has misunderstood segregation problems. Recent work with an infrared camera (also called a thermal camera) in Alaska, Louisiana, Texas, and other states is showing the severity of thermal segregation.

Alaska DOT&PF now has an infrared camera, which looks much like a video camera, that shows where heat loss occurs. Accompanying software translates the information acquired pictorially into graphs and plots temperatures. For example, the software will convert a colored shot of the paving mat (the colors depict varying temperatures across the mat) behind the paver into a graphic with specific temperatures noted numerically across the picture.





Researchers plan to visit paving projects to educate department personnel and contractors about thermal segregation and to assist them in reducing the problem. Learning where thermal segregation is likely to occur and what its causes are will allow us to correct problems that we didn't know about. We think that education about thermal segregation, combined with the department's existing QLA specification, will be enough to reduce thermal segregation in Alaska.



*An example of thermal segregation from a different paving project, taken at a similar angle behind the paver. Note the broad temperature range across the mat, an indication that somewhere in the process of getting asphalt from the hot plant through the paver, the asphalt has cooled unevenly. The wider the temperature variance, the greater the differential compaction, resulting in potholes.*

## Using Geophysical Methods in Pits

Today, Alaska DOT&PF uses seismic methods to determine the volume of usable materials in a potential source borrow pit. Geologists estimate the volume of usable material by interpreting drill logs taken throughout the area. However, experience shows that estimated volumes differ significantly from available materials when the subsurface geology is complex. There is a critical need to further evaluate and develop the seismic method and to develop methods that extrapolate the geology from a drill log to the surrounding area to better define borrow source material type(s) and volume.

Geophysical methods can quickly and accurately extrapolate the geology from drill logs to nearby areas within a borrow source. The resulting accuracy in determining material volume should increase, and the number of test drill holes needed to define borrow source volume should decrease.

Researchers will correlate three primary techniques with the geology from drill logs in a potential borrow source area and use those techniques to (1) estimate the subsurface geology in the surrounding area, and (2) predict the volume of usable material. Seismic wave refraction, ground penetrating radar, and three types of ground resistivity geophysical measurements will be used in the correlation. We expect to achieve better volume estimates, and to reduce the time and expense involved in establishing borrow sources.

*For more information, contact Billy Connor, P.E., Research Manager, 907-451-5479, [billy\\_connor@dot.state.ak.us](mailto:billy_connor@dot.state.ak.us)*



**Training** ([www.dot.state.ak.us](http://www.dot.state.ak.us), click on "Training Opportunities") 

Date	Event	Sponsor/Contact	Location
July 10–11	Basic Grader Operator Training	Sharon McLeod-Everette (907) 451-5323	Anvik
July 12–13			St. Mary's
July 14–15			Emmonak
July 16–17			Unalakleet
July 17–18			Nome
July 19–20			Kotzebue
July 22–23			Shungnak
July 10–14	Intermediate Grader Operator Training	Sharon McLeod-Everette (907) 451-5323	Soldotna
July 17–21			Palmer
July 17–19	Modern Roundabouts: Planning & Design	Scott Thomas (907) 269-0639	Anchorage
Aug. 1–3	Air Quality (AQ) Training	Simon Howell (907) 451-5488	Anchorage
Aug. 14–18	Writing Training	Simon Howell (907) 451-5488	Juneau
Aug. 21–25			Anchorage
Oct. 2–6 and 9–12			Fairbanks
July 18	Permafrost Workshop	Simon Howell (907) 451-5488	Fairbanks
July 20			Anchorage
TBA	NHI 14205: Documenting NEPA and Transportation Decision-Making (3-day workshop)	Simon Howell (907) 451-5488	Anchorage Fairbanks

## Meetings Around Alaska

Society	Chapter	Meeting Days	Location & Contact
ASCE	Anchorage	Monthly, 3rd Tues., noon	Northern Lights Inn
	Fairbanks	Monthly, 3rd Wed., noon	Captain Bartlett Inn
	Juneau	Monthly, 2nd Wed., noon*	Westmark Hotel * except June–Aug.
ASPE	Anchorage	Monthly, 2nd Thurs., noon	West Coast International Inn
	Fairbanks	Monthly, 1st Fri., noon	Captain Bartlett Inn
	Juneau	Monthly, 2nd Wed., noon*	Westmark Hotel * except June–Aug.
ASPLS	Anchorage	Monthly, 4th Tues., noon	Ah Sa Wan Restaurant
	Fairbanks	Monthly, 4th Fri., noon	Ethel's Sunset Inn
	Mat-Su Valley	Monthly, last Wed., noon	Windbreak Cafe George Strother, 745-9810
AWRA	Northern Region	Monthly, 3rd Wed., noon	Rm 531 Duckering Bldg., University of Alaska Fairbanks Larry Hinzman, 474-7331
ICBO	Northern Chapter	Monthly, 1st Wed., noon	Zach's Sophie Station Jeff Russell, 451-5495
ITE	Anchorage	Monthly, 4th Thurs., noon**	Sourdough Mining Co. ** except July & Dec.
IRWA	Sourdoughs Ch. 49	Monthly, 3rd Tues., noon**	West Coast International Inn
	Arctic Trails Ch. 71	Monthly, 2nd Thurs., noon**	Oriental House
	Totem Ch. 59	Monthly, 1st Wed., noon	Mike's Place, Douglas ** except July & Dec.
PE in Government	Anchorage	Monthly, last Fri., 7 a.m.	Elmer's Restaurant
Society of Women Engineers	Anchorage	varies	Karen Helgeson, 522-6513

## Research and Technology Transfer Staff Changes

Because over half of the Research and Technology Transfer staff is new, we'd like to take this opportunity to re-introduce ourselves to you.

Billy Connor is the research manager; he oversees both the Research program and the Local Technical Assistance Program's Technology Transfer (T2) program. Linda Gavin, clerk for Research and T2, replaces Christel Kennedy. In April, Christel relocated to DOT&PF's Northern Region Construction section. Bob McHattie retired on December 31, 1999 (congrats, Bob!); his implementation engineer position is currently vacant. Clint Adler just moved to DOT&PF from Department of Environmental Conservation in June. As research engineer, he replaces Jim Bennett, who moved on to a position in Preconstruction with DOT&PF's Northern Region design group. Simon Howell came to work for T2 in April 1999. As a training specialist, he develops

training programs and coordinates others—plus he takes care of our web page. And finally, Sharon McLeod-Everette is the T2 Program Manager. She oversees the LTAP program, as well as the National Highway Institute program and other training programs in Research and T2.

### Contact information:

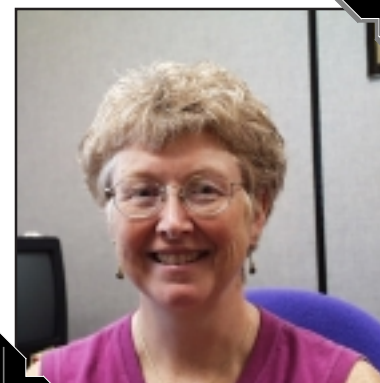
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Implementation engineer (vacant)	907-451-5322



*Billy Connor*



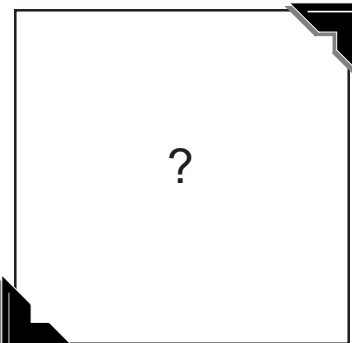
*Simon Howell*



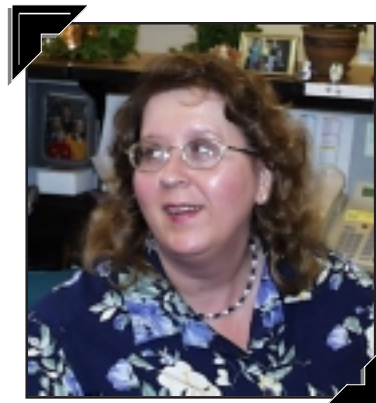
*Sharon McLeod-Everette*



*Clint Adler*



*Implementation Engineer*



*Linda Gavin*

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## ***T<sup>2</sup> Center Advisory Board***

**Billy Connor**, Chair, Research Manager, DOT&PF

**Larry Crouder**, City of Fairbanks

**Drew Sielbach**, Federal Highway Administration

**Chris Kepler**, Central Region DOT&PF

**Trent Mackey**, Fairbanks North Star Borough

**David Mumford**, Municipality of Anchorage

Vacant, North Slope Borough

**Jim Swing**, Matanuska-Susitna Borough

**Ernie Mueller**, City and Borough of Juneau

**Paul Knysh**, Yukon Territory Government

**Bill Dunn**, Kenai Peninsula Borough

**Ken Vaughn**, U.S. Forest Service

Web page: [http://www.dot.state.ak.us/external/  
state\\_wide/t2/index.html](http://www.dot.state.ak.us/external/state_wide/t2/index.html)



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**Department of Transportation and Public Facilities**  
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